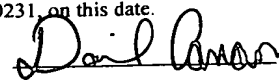


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2 A PRINTER HAVING A SPELL CHECKING FEATURE

3 The present invention generally relates to a printer having
4 enhanced features, and more particularly to a printer adapted to provide print
5 services and further adapted to provide spell checking services.

6 Computer-based word processing software packages continue to
7 grow in sophistication. For example, many software packages include a variety
8 of integrated features intended to enhance the document creation process, such
9 as a spell checking feature that allows a user to check a document for spelling
10 errors. However, many software packages do not include an integrated spell
11 checking feature and, therefore, do not allow a user to perform an automatic
12 spell check of a document file.

13 In addition, personal digital assistants (PDAs) are becoming more
14 widely used and, with the advent of wireless communication systems like
15 Bluetooth, allow PDA users to access print services offered by a printer.
16 Unfortunately, PDA's typically include a limited amount of memory and are
17 not able to support an enhanced software feature such as a spell checking
18 feature. Thus, PDA users, although able to print a document at a printer, are
19 unable to check the spelling of a document stored in the PDA.

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BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a block diagram of a print apparatus that is coupled to a user's computer and that provides the user with a spell checking program according to one aspect of the present invention;

FIG. 2 is a block diagram of a print apparatus that is coupled to a set of users' computers via a communication network and that provides the set of users' computers with a spell checking feature according to another aspect of the present invention;

FIGS. 3(a)-(b) are a flow chart representing a method for providing the spell checking feature to the network computers via the print apparatus of FIGS. 1 and 2 according to a further aspect of the present invention; and,

FIG. 4 is a flow chart representing a method for providing the spell checking feature to the network computers via the print apparatus of FIGS. 1 and 2 according to a still further aspect of the present invention.

SUMMARY OF THE INVENTION

The present invention is directed to a print apparatus having a spell checking feature that enables spell checking of the terminology in a computer-generated document. The print apparatus includes a processor for executing a spell checking program and a memory for storing the spell-checking program. The print apparatus may also be coupled to a computer network to provide a plurality of computers that are coupled to the network with access to the spell checking program.

DETAILED DESCRIPTION

Referring now to the drawings wherein like reference numerals refer to similar or identical parts throughout the several views, and more specifically to FIG. 1 thereof, a computer 10 includes a central processing unit (CPU) 12 that executes an editor program 14 to enable the creation, formatting

1 and editing of computer-generated documents that are stored as document files
2 in a memory 16. A monitor 18, keyboard 20 and mouse 22 enable
3 communication between a user and the CPU 12. Although not shown in FIG.
4 1, the computer 10 may further include any number of peripheral devices
5 including, for example, a modem, a sound card, a video card, etc. Further, the
6 computer 10 need not be a stationary device but may be implemented using a
7 laptop computer or even with a personal digital assistant (PDA). Moreover, the
8 computer 10 may include a wireless communication device (not shown) that
9 enables wireless communication.

10 A print driver 24 is also coupled to the CPU 12 for formatting
11 document files stored in the memory 16 for printing at a print apparatus, such
12 as a printer 26, which is coupled to the computer 10 via, for example, a printer
13 cable 28. Specifically, the print driver 24 converts document files to a page
14 description language format before causing the document files to be transmitted
15 to the printer 26 for printing. As will be understood by one having ordinary
16 skill in the art, a document file converted to a page description language format
17 includes information required by the printer 26 to enable printing of the
18 document file at the printer 26.

19 The printer 26 includes a processor 30 that executes a set of
20 software programs stored in a memory 36, including, for example, a spell
21 checking program 32 and a page description language engine program 34. The
22 spell checking program 32, when executed by the processor 30, checks the
23 accuracy of the spelling of a set of terms included in a document file by
24 comparing the terms to the contents of a database 33 containing a dictionary of
25 terms. The dictionary database 33, which may be integrated with the spell
26 checking program 32, is also stored in the memory 36 and may be tailored to
27 include language associated with a specific industry. For example, the
28 database may include technical terms associated with the medical profession
29 thereby making the spell checking program 32 suitable for usage in the medical
30 profession. Alternatively, the database may include technical terms associated

1 with any desired industry, including, the computer industry, the electronics
2 industry, the telecommunications industry, the banking industry, etc.

3 The page description language engine program 34 formats
4 document files provided to the printer 26 in a page description language format
5 for printing at a print engine 25. Although described herein as separate
6 software programs, the spell checking program 32 may be incorporated into the
7 page description language program 34. Further, the page description language
8 engine program 34 and the spell checking program 32 may be implemented
9 using software, hardware, firmware and/or a combination thereof. In addition,
10 software programs that enable communication between the printer 26 and the
11 computer 10 and that further enable the printing of documents supplied to the
12 printer 26 by the computer 10 may also be stored in the memory 36.

13 The print engine 25 is coupled to and controlled by the processor
14 30 and operates to print document files. The print engine 25 may be
15 implemented using any conventional print engine adapted to perform
16 conventional printing functions.

17 The printer 26, instead of being physically coupled to the
18 computer 10 may be wirelessly coupled to the computer 10. Specifically, the
19 printer 26 may include a wireless communication device (not shown) that
20 enables communication with the wireless communication device (not shown)
21 disposed in the computer 10. In addition, the computer 10 and printer 26 may
22 communicate using a wireless communication protocol such as Bluetooth.

23 Referring now to FIG. 2, in a second embodiment, the computer
24 10 may comprise one of a plurality of computers 10 coupled to a
25 communication network 42 that is controlled by a network server computer 44.
26 In addition, the printer 26 may be coupled to the communication network 42
27 and may provide print services to all of the computers 10 coupled to the
28 network 42.

29 As described with respect to FIG. 1, the printer 26 and computers
30 10 shown in FIG. 2 may be adapted to communicate wirelessly. Specifically,

1 the network 42 may comprise a wireless communication network. For
2 example, the printer 26 and computers 10 may be adapted to include wireless
3 communication devices (not shown) that enable wireless communication via a
4 wireless communication protocol such as Bluetooth. Alternatively, the
5 computers 10 may be adapted to access the printer 26 via any other mode of
6 communication such as a standard telephone line and a telephone modem.

7 Referring now to FIG. 3(a) and to FIGs. 1 and 2, the spell
8 checking program 32 may be executed using a method 50 that begins when a
9 user initiates a print job by selecting a print command associated with any of
10 the software programs stored on the computer 10 (step 52). In response to the
11 print command, the CPU 12 disposed in the computer 10 causes a print dialog
12 window to appear on the computer monitor 18 (step 54). As will be
13 appreciated by one having ordinary skill in the art, a print dialog window
14 allows a user to select the format in which a document shall be printed and may
15 be generated. For example, a print dialog window may include options that
16 allow the user to specify whether the document file shall be printed in a portrait
17 or landscape orientation, whether the entire document file shall be printed or
18 only portions of the document file, and whether a single or multiple copies of
19 the document file shall be printed.

20 In addition to the conventional print features enabled via the print
21 dialog window described above, the print dialog window further includes an
22 option for enabling the spell checking program 32. When the print dialog
23 window appears, the user selects the spell checking option thereby causing a
24 spell checking print job flag to be activated (step 56) and further selects any
25 other desired print options via the print dialog window. It will be appreciated
26 that as used herein the term "flag" is intended to refer to a logical operator.
27 Other selected options may likewise result in other corresponding flags to be
28 activated. Next, the user indicates that all of the appropriate print options have
29 been selected by, for example, using the mouse 22 to select an appropriate one
30 of the buttons displayed on the print dialog window. In response to the

1 selection, the print dialog window is removed from the display and the
2 information entered via the print dialog window is transmitted to the print
3 driver 24 for processing the print job (step 58).

4 In processing the print job, the print driver 24 may assemble a
5 "print job data file" (step 60). A "print job data file" as used herein comprises
6 a digital data file that contains the textual data to be put into document form.
7 The job file may additionally comprise data regarding format of the document
8 text such as margins, character font, language, and the like. The job file may
9 also be assembled using a protocol that the printer 26 will be able to print (e.g.,
10 document prepared in MS WORD format may be converted to a printer ready
11 format such as PCL or postscript). The job file also comprises data conveying
12 information input by the user through the print dialog display. This print dialog
13 data comprises, for example, the spelling check flag. This data may be
14 included in the job file in a seamless manner, or may be appended to the job
15 file in a partitioned or otherwise distinct data portion, such as in a header.

16 After assembly of the print job file is complete, the file is
17 communicated to the printer 26 (step 62). Upon receiving the job file, the
18 printer processor 30 then undertakes processing the file (step 62). Generally,
19 processing of the file comprises interpreting the information contained in the
20 job file to determine what the printed document should look like, and
21 instructing the various components of the printer 26 as required to undertake
22 the printing of the document. In so doing, and with reference now made to the
23 flow chart of FIG. 3(b) that expands on step 62 of FIG. 3(a), the processor 30
24 may instruct the page description language engine 34 to determine from the job
25 file whether specific actions should be taken (step 70). The page description
26 language engine 34 identifies each print job flag incorporated into the job file
27 in a header or the like and performs a set of functions necessary to implement
28 the formatting feature associated with each print job flag.

29 Upon determining that the print job flag is activated indicating
30 that spell checking has been enabled, the page description language engine 34

1 invokes the spell checking program 32 (step 74). The spell checking program
2 32, which may perform any of the conventional methods for spell checking,
3 compares the terms included in the document file to a set of terms included in
4 the dictionary database 33 to determine whether any of the terms in the
5 document file have been misspelled.

6 Next, the spell checking program 32 causes one or more codes to
7 be inserted into the document file to identify the misspelled terms. The
8 inserted codes may include standard page description language codes that,
9 when processed by the page description language engine program 34, cause the
10 print engine 25 to print the document file with the misspelled terms "marked"
11 so as to be identifiable by the user as being misspelled. As used herein, the
12 term "marked" will be understood to indicate any manner of printing to convey
13 the condition of being misspelled. For example, the codes may indicate that
14 the misspelled terms are to be "marked" by highlighting, underlining, bolding,
15 italicizing, coloring, or the like. In addition, the spell checking program 32
16 may insert codes that instruct the page description language engine 34 to cause
17 the print engine 25 to print a suggested spelling for the misspelled term into the
18 printed document at a location immediately following the misspelled term in a
19 similar highlighted or the like manner. After all of the codes have been
20 inserted and the page description language engine 34 has finished processing
21 the document file, the print language description engine causes the print engine
22 25 to print the document file (step 76). It will be appreciated that the printer
23 apparatus of the invention may of course also cause the page definition
24 language engine 34 to determine whether additional flags are activated in the
25 job file and to accordingly take additional actions as called for.

26 Referring now to FIG. 4 and to FIGs. 1 and 2, in an alternative
27 embodiment, the printer 26 may be adapted to supply spell checking services to
28 the computers 10 via the network 42 in much the same manner that a
29 conventional network server is adapted to provide application services to
30 network computers. Specifically, a method 100 for using the printer 26 to

1 supply spell checking services to the computers 10 via the network 12 may
2 begin when a user invokes the spell checking program 32 installed in the
3 printer 26 at the computer 10 (step 102). The spell checking program 32 may
4 be invoked using, for example, an icon displayed on the computer monitor 18
5 that, when selected via the mouse 22, instructs the computer 10 to
6 communicate a request for spell checking service to the printer 26 via the
7 network 42. Of course, the software required to implement the icon will have
8 been previously installed in the computer 10. The processor 30 disposed in the
9 printer 26 responds to the request by making the spell checking program 32
10 available for usage at the computer 10 in the same manner as a network server
11 provides application services to the network computers 10 (step 104).
12 Specifically, in invention embodiments, the spell checking program 32 may be
13 configured to operate as a distributed service implemented as an object as
14 specified under the Distributed Component Object Model specification
15 (DCOM), the Common Request Broker Architecture (CORBA) specification,
16 or the like.

17 As will be appreciated by one having ordinary skill in the art, a
18 software program available to a plurality of computers as a DCOM or a
19 CORBA object may be invoked and operated using any of a plurality of
20 computers coupled to a network but is actually executed by a single network
21 processor that communicates with the plurality of computers via the network.
22 Moreover, a DCOM/CORBA enabled service is typically made available in a
23 manner that is transparent to the user such that the user is not aware that the
24 program providing the DCOM/CORBA enabled service resides on a remotely
25 located network computer.

26 Thus, for example, when invoked via the computer 10, the spell
27 checking program 32 residing in the printer 26 may cause a dialog window to
28 be displayed on the computer monitor 18. The window may contain a set of
29 boxes or data input fields by which the user may specify the portions of the
30 document file to be spell checked. As will be understood by one having

1 ordinary skill in the art, conventional spell checking programs and methods for
2 implementing such programs are widely available and the methods associated
3 with operating a software program as a D-COM or a CORBA are well known
4 in the art. Accordingly, further detail regarding such programs is not necessary
5 to be provided herein.

6 After using the spell checking program 32 at the computer 10, the
7 user may exit the program by, for example, selecting a close option provided
8 by the spell checking program 32 (step 106). The user's desire to exit the
9 program is communicated to the processor 30 disposed in the printer 26 that in
10 turn responds by halting execution of the spell checking program 32.

11 From the foregoing description, it should be understood that a
12 print apparatus adapted to provide spell checking services has been shown and
13 described, having many desirable attributes and advantages. In particular, the
14 print apparatus provides spell checking services thereby eliminating the need to
15 install a spell checking program 32 on a user's computer 10 and conserving the
16 space available on the computer hard drive. In addition, the print apparatus
17 supplies spell checking services for documents created using any software
18 application.

19 While various embodiments of the present invention have been
20 shown and described, it should be understood that other modifications,
21 substitutions and alternatives are apparent to one of ordinary skill in the art.